Chemistry I: Gas Law Problems 2012 KEY-B

1 .A gas occupies **12.3 liters** at a pressure of **40.0 mmHg**. If the **temperature remains constant**, what is the **new volume** when the pressure is increased to **60.0 mmHg**? (8.2 L)

$$\frac{(40.0\ \text{mmHg})(12.3\ \text{L})}{1} = \frac{(60.0\ \text{mmHg})(V_2)}{1}$$

2. If a gas at 25.0 ^{o}C occupies **3.60 liters** at a pressure of **1.00 atm**, **what will be its volume** at a pressure of **50 atm** and **the temperature remains the same?** (0.072 L)

$$\frac{(1\text{atm})(3.6\ \text{L})}{1} = \frac{(50\ \text{atm})(V_2)}{1}$$

3. To what pressure must a gas that occupies 400.0 cu. ft. at standard pressure be compressed to fit into a 3.00 cubic foot tank? The temperature remains the same. (133.3 atm or 101333.3 mm Hg)

$$\frac{(1\ \text{atm})(400.0\ \text{ft}^3)}{1} = \frac{(P_2)(3.0\ \text{ft}^3)}{1} \quad \text{OR} \quad \frac{(760\ \text{mmHg})(400.0\ \text{ft}^3)}{1} = \frac{(P_2)(3.0\ \text{ft}^3)}{1}$$

4. A gas occupies 1.56 L at 1.00 atm. What will be the volume of this gas if the pressure becomes 3.0 atm with the temperature remaining the same? (0.52 L)

$$\frac{(1\ \text{atm})(1.56\ \ )}{1} = \frac{(3.0\ \text{atm})(V_2)}{1}$$

5. A gas occupies 11.2 liters at 0.860 atm. With the temperature constant, what is the pressure if the volume becomes 15.0 L? (0.64 atm)

$$\frac{(0.860\ \text{atm})(11.2\ \text{L})}{1} = \frac{(P_2)(15.0\ \text{L})}{1}$$

6. **500.0 mL** of a gas is collected at **745.0 mmHg**. **What will the volume** be at **standard pressure**? **T_1= T_2 are equal**. (490.1 mL)

$$\frac{(745.0\ \text{mmHg})(500\ \text{mL})}{1} = \frac{(760.0\ \text{mmHg})(V_2)}{1}$$

7. Convert **350.0 mL** at **740.0 mm of Hg** to its **new volume** at **standard pressure** with the **temperature constant**. (340.8 mL)

$$\frac{(740.0\ \text{mmHg})(350\ \text{mL})}{1} = \frac{(760.0\ \text{mmHg})(V_2)}{1}$$

8. Convert 3.38 L at 63.0 atm to its new volume at standard pressure with the temperature constant. (212.9 L)

$$\frac{(63.0\text{ atm})(3.38\text{ L})}{1}=\frac{(1.0\text{ atm})(V_2)}{1}$$

9. Convert 273.15 mL at 166.0 mm of Hg to its new volume at standard pressure with the temperature constant.(59.7 mL)

$$\frac{(166.0\text{ mmHg})(273.15\text{ mL})}{1}=\frac{(760\text{ mmHg})(V_2)}{1}$$

10. Convert **77.0 L** at **18.0 mm of Hg** to its **new volume** at **standard pressure** with the **temperature constant**. (1.8 L)

$$\frac{(18.0\text{ mmHg})(77.0\text{ L})}{1}=\frac{(760\text{ mmHg})(V_2)}{1}$$

11. Calculate the **decrease in temperature** (**in Kelvin**) when **2.00 L** at **20.0 ^{o}C** is compressed to **1.00 L** with **pressure remaining the same**. (146.5 K)

$$20\ ^oC+273=293\text{ K}\qquad \frac{(1)(2.0\text{ L})}{293\text{ K}}=\frac{(1)(1.0\text{ L})}{T_2}$$

12. A gas occupies **900.0 mL** at a temperature of **27.0 ^{o}C**. **Under constant pressure**, **what is the volume** at **132.0 ^{o}C**? (1215 mL)

$$T_1=273+27=300\text{ K}\qquad T_2=273+132=305K\qquad \frac{(1)(900\text{ mL})}{300\text{ K}}=\frac{(1)(V_2)}{405\text{ K}}$$

13. What **change in volume** results if **60.0 mL** of gas is cooled from **33.0 ^{o}C** to **5.00 ^{o}C** while **pressure is held constant**? (54.5 mL)

$$T_1=273+33=306\text{ K}\qquad T_2=273+5=278K\qquad \frac{(1)(60\text{ mL})}{306\text{ K}}=\frac{(1)(V_2)}{278\text{ K}}$$

14. Given 300.0 mL of a gas at 17.0 ^{o}C. What is the new volume at 10.0 ^{o}C? Pressure remains constant. (292.8 mL)

$$T_1=273+17=290\text{ K}\qquad T_2=273+10=283K\qquad \frac{(1)(300\text{ mL})}{290\text{ K}}=\frac{(1)(V_2)}{283\text{ K}}$$

15. A gas occupies 1.00 L at standard temperature and pressure. What is the volume at 333.0 ^{o}C and standard pressure? (2.22 L)

$$T_2=273+333=606K\qquad \frac{(1\text{ atm})(300\text{ mL})}{273\text{ K}}=\frac{(1\text{ atm})(V_2)}{606\text{ K}}$$

16. At 27.00 °C a gas has a volume of 6.00 L and 1 atm. What will the volume be at 150.0 °C and 1 atm? (8.46 L)

$T_1 = 273 + 27 = 300K$ $T_2 = 273 + 150 = 423K$ $\frac{(1\text{ atm})(6\text{ L})}{300\text{ K}} = \frac{(1\text{ atm})(V_2)}{423\text{ K}}$

17. At 225.0 °C a gas has a volume of 400.0 mL. What is the volume of this gas at 127.0 °C? Pressure remains constant. (321.3 mL)

$T_1 = 273 + 225 = 498K$ $T_2 = 273 + 127 = 400K$ $\frac{(1)(400\text{ mL})}{498\text{ K}} = \frac{(1)(V_2)}{400\text{ K}}$

18. At 210.0 °C and 2 atm of pressure, a gas has a volume of 8.00 L. What is the volume of this gas at -23.0 °C and 2 atm? (4.1 L)

$T_1 = 273 + 210 = 483K$ $T_2 = 273 + (-23) = 250K$ $\frac{(2\text{ atm})(8.0\text{ L})}{483\text{ K}} = \frac{(2\text{ atm})(V_2)}{250\text{ K}}$

19. The temperature of a 4.00 L sample of gas is changed from 10.0 °C to 20.0 °C. What is the new volume if the pressure remains the same? (4.14 L)

$T_1 = 273 + 10 = 283K$ $T_2 = 273 + 20 = 293K$ $\frac{(1\text{ atm})(4.0\text{ L})}{283\text{ K}} = \frac{(1\text{ atm})(x\text{ L})}{293\text{ K}}$

20. Carbon dioxide is usually formed when gasoline is burned. If 30.0 L of $C0_2$ is produced at a temperature of 1.00 X10^3 °C and allowed to reach room temperature (25.0 °C) without any pressure changes, what is the new volume of the carbon dioxide? (7.0 L)

$T_1 = 273 + 1000 = 1273K$ $T_2 = 273 + 25 = 298K$ $\frac{(1)(30.0\text{ L})}{1273\text{ K}} = \frac{(1)(V_2)}{298\text{ K}}$

21. A 600.0 mL sample of nitrogen is warmed from 77.0 °C to 86.0 °C. Find its new volume when the pressure remains constant. (615.4 mL)

$T_1 = 273 + 77 = 350K$ $T_2 = 273 + 86 = 359K$ $\frac{(1)(600\text{ mL})}{350\text{ K}} = \frac{(1)(V_2)}{359\text{ K}}$

22. What volume change occurs to a 400.0 mL gas sample as the temperature increases from 22.0 °C to 30.0 °C and constant pressure? (410.8 mL)

$T_1 = 273 + 22 = 295K$ $T_2 = 273 + 30 = 303K$ $\frac{(1)(400\text{ mL})}{295\text{ K}} = \frac{(1)(V_2)}{303\text{ K}}$

23. A gas syringe contains 56.05 milliliters of a gas at 315.1 K. Determine the volume that the gas will occupy if the temperature is increased to 380.5 K and no change in pressure has occurred? (67.68 mL)

$$\frac{(1)(56.05\text{ mL})}{315.1\text{ K}} = \frac{(1)(V_2)}{380.5\text{ K}}$$

24. A gas syringe contains 42.3 milliliters of a gas at 98.15 °C. With pressure remaining constant, determine the volume that the gas will occupy if the temperature is decreased to -18.50 °C. (29.0 mL)

$$T_1 = 273.15 + 98.15 = 371.30K \quad T_2 = 273.15 + (-18.50) = 254.65K$$

$$\frac{(1)(42.3\text{ mL})}{371.30\text{K}} = \frac{(1)(V_2)}{254.65\text{ K}}$$

25. A gas has a volume of 800.0 mL at -23.00 °C and 300.0 torr. What would the volume of the gas be at 227.0 °C and 600.0 torr of pressure? (800 mL)

$$T_1 = 273 + (-23) = 250K \quad T_2 = 273 + 227 = 500K \quad \frac{(300\text{ torr})(800\text{ mL})}{250\text{ K}} = \frac{(600\text{ torr})(V_2)}{500\text{ K}}$$

26. 500.0 liters of a gas are prepared at 700.0 mmHg and 200.0 °C. The gas is placed into a tank under high pressure. When the tank cools to 20.0 °C, the pressure of the gas is 30.0 atm. What is the volume of the gas?

(9.5 L)

$$T_1 = 273 + 200 = 473K \quad T_2 = 273 + 20 = 293K$$

There is a mismatch with the pressure units P_1 is 700.0 mmHg and P_2 is 30.0 atm. They both must be in the same units!!

So, you can convert 30.0 atm to mmHg or convert 700.0 mmHg to atm

1. $\frac{760\text{ mmHg}}{1\text{ atm}} = \frac{x\text{ mmHg}}{30.0\text{ atm}}$ OR 2. $\frac{1\text{ atm}}{760\text{ mmHg}} = \frac{x\text{ atm}}{700\text{ mmHg}}$

$$\frac{(700\text{ mmHg})(500\text{ L})}{473\text{ K}} = \frac{(22800\text{ mmHg})(V_2)}{293\text{ K}} \qquad \frac{(0.92\text{ atm})(500\text{ L})}{473\text{ K}} = \frac{(30.0\text{ atm})(V_2)}{293\text{ K}}$$

27. What is the final volume of a 400.0 mL gas sample that is subjected to a temperature change from 22.0 °C to 30.0 °C and a pressure change from 760.0 mmHg to 360.0 mmHg? (867.4 mL)

$$T_1 = 273 + 22 = 295K \quad T_2 = 273 + 30 = 303K \quad \frac{(760\text{ mmHg})(400\text{ mL})}{295\text{ K}} = \frac{(360\text{ mmHg})(V_2)}{303\text{ K}}$$

28. What is the volume of gas at 2.0 atm and 200.0 K if its original volume was 300.0 L at 0.250 atm and 400.0 K? (18.75 L)

$$\frac{(0.25\text{ atm})(300.0\text{ L})}{400.0\text{ K}} = \frac{(2.00\text{ atm})(V_2)}{200.0\text{ K}}$$

29. At conditions of 785.0 torr of pressure and 15.0 °C temperature, a gas occupies a volume of 45.5 mL. What will be the volume of the same gas at 745.0 torr and 30.0 °C? (50.4 mL)

$$T_1 = 273 + 15 = 288K \quad T_2 = 273 + 30 = 303K \qquad \frac{(785.0\text{ torr})(45.5\text{ mL})}{288\text{ K}} = \frac{(745.0\text{ torr})(V_2)}{303\text{ K}}$$

30. A gas occupies a volume of 34.2 mL at a temperature of 15.0 ^{o}C and a pressure of 800.0 torr. What will be the volume of this gas at standard conditions? (34.1 mL)

$T_1 = 273 + 15 = 288K$ $\qquad \frac{(800.0 \text{ torr})(34.2 \text{ mL})}{288 \text{ K}} = \frac{(760 \text{ torr})(V_2)}{273 \text{ K}}$

31. The volume of a gas originally at standard temperature and pressure was recorded as 488.8 mL. What volume would the same gas occupy when subjected to a pressure of 100.0 atm and temperature of -245.0 ^{o}C? (0.50 mL)

$T_2 = 273 + (-245.0) = 28K$ $\qquad \frac{(1 \text{ atm})(488.8 \text{ mL})}{273 \text{ K}} = \frac{(100 \text{ atm})(V_2)}{28 \text{ K}}$

32. At a pressure of 780.0 mmHg and 24.2 ^{o}C, a certain gas has a volume of 350.0 mL. What will be the volume of this gas under STP? (329.9 mL)

$T_1 = 273.15 + 24.2 = 297.35K$ $\qquad \frac{(780.0)(350.0 \text{ mL})}{297.35 \text{ K}} = \frac{(760 \text{ mmHg})(V_2)}{273 \text{ K}}$

33. A gas sample occupies 3.25 liters at 24.5 ^{o}C and 1825 mmHg. Determine the temperature at which the gas will occupy 4250 mL at 1.5 atm. (243.15 K)

$T_1 = 273 + 24.5 = 297.5K$ Volume units are not the same. The 4250 mL may be converted to liters, so $4250 \text{ mL} \times \frac{1 \text{ liter}}{1000 \text{ mL}} = 4.25 \text{ L}$

And pressure units are not the same. So, convert 1825 mmHg to atmospheres.

$1825 \text{ mmHg} \times \frac{1 \text{ atm}}{760 \text{ mmHg}} = 2.4 \text{ atm}$

Then $\frac{(2.4 \text{ atm})(3.25 \text{ L})}{297.5 \text{ K}} = \frac{(1.5 \text{ atm})(4.25 \text{ L})}{T_2}$

34. If 10.0 liters of oxygen at STP are heated to 512 ^{o}C, what will be the new volume of gas if the pressure is also increased to 1520.0 mm of mercury? (14.4 L)

$T_2 = 273 + 512 = 785K$ $\qquad \frac{(760 \text{ mmHg})(10 \text{ L})}{273 \text{ K}} = \frac{(1520 \text{ mmHg})(V_2)}{785 \text{ K}}$

35. What is the volume at STP of 720.0 mL of a gas collected at 20.0 ^{o}C and 3.00 atm pressure? (2012.6 mL)

$T_1 = 273 + 20 = 293K$ $\qquad \frac{(3 \text{ atm})(720.0 \text{ mL})}{293\text{K}} = \frac{(1 \text{ atm})(V_2)}{273 \text{ K}}$

36. 2.00 liters of hydrogen, originally at 25.0 ^{o}C and 750.0 mm of mercury, are heated until a volume of 20.0 liters and a pressure of 3.50 atmospheres is reached. What is the new temperature? (10569 K)

$$T_1 = 273 + 25 = 298K$$

So, you can convert 3.50 atm to mmHg or convert 700.0 mmHg to atm

1. $\frac{760 \text{ mmHg}}{1 \text{ atm}} = \frac{x \text{ mmHg}}{3.5 \text{ atm}}$ OR 2. $\frac{1 \text{ atm}}{760 \text{ mmHg}} = \frac{x \text{ atm}}{750 \text{ mmHg}}$

$$\frac{(750 \text{ mmHg})(2.0 \text{ L})}{298 \text{ K}} = \frac{(2660 \text{ mmHg})(20.0\text{L})}{T_2} \qquad \frac{(0.99 \text{ atm})(2.0 \text{ L})}{298 \text{ K}} = \frac{(3.5 \text{ atm})(20.0 \text{ L})}{T_2}$$

37. A gas balloon has a volume of 106.0 liters when the temperature is 45.0 ^{o}C and the pressure is 740.0 mm of mercury. What will its volume be at 20.0 ^{o}C and 780 .0 mm of mercury pressure? (92.7 L)

$$T_1 = 273 + 45 = 318K \qquad T_2 = 273 + 20 = 293K \qquad \frac{(740.0 \text{ torr})(106 \text{ L})}{318 \text{ K}} = \frac{(780.0 \text{ torr})(V_2)}{293 \text{ K}}$$

38. A 73.0 mL sample of nitrogen at STP is heated to 80.0 ^{o}C and the volume increases to 4.53 L. What is the new pressure? (0.02 atm or 15.8 mmHg)

Mismatch is volume units. Therefore, convert 73 mL to liters.

$$73 \text{ mL} \times \frac{1 \text{ L}}{1000 \text{ mL}} = 0.073 \text{ L}$$

$$T_2 = 273 + 80 = 353K \qquad \frac{(760 \text{ mmHg})(0.073 \text{ L})}{273 \text{ K}} = \frac{(P_2)(4.53 \text{ L})}{353 \text{ K}}$$

39. A gas is heated from 263.0 K to 298.0 K and the volume is increased from 24.0 liters to 35.0 liters by moving a large piston within a cylinder. If the original pressure was 1.00 atm, what would the final pressure be? (0.78 atm or 590.5 mmHg))

$$\frac{(1.00 \text{ atm})(24.0 \text{ L})}{263.0 \text{ K}} = \frac{(x \text{ atm})(35.0 \text{ L})}{298.0 \text{ K}}$$

40. The pressure of a gas is reduced from 1200.0 mmHg to 850.0 mmHg as the volume of its container increases by a moving piston from 85.0 mL to 350.0 mL. What would the final temperature be if the original temperature were 90.0 ^{o}C? (1058.75 K)

$$T_1 = 273 + 90 = 363K \qquad T_2 = x \qquad \frac{(1200.0 \text{ mmHg})(85 \text{ mL})}{363 \text{ K}} = \frac{(850.0 \text{ mmHg})(350 \text{ mL})}{\text{T}_2}$$

Gases collected over (requires Dalton's Law)

IMPORTANT NOTE: A gas collected over water is always considered to be saturated with water vapor.
The vapor pressure of water varies with temperature and **must be looked up in a reference source**.

41. What is the new volume at STP, of 720.0 mL of a gas volume collected over water at 25.0 ^{o} C and 3.00 atm pressure? (1978.8 mL)

$P_{gas} = 3.0 \text{ atm - } 0.03 \text{ atm} = 2.97 \text{ atm}$

$$\frac{(3.0 \text{ atm})(720 \text{ mL})}{298 \text{ K}} = \frac{(1.0 \text{ atm})(x \text{ mL})}{273 \text{ K}}$$

42. 500.0 mL of a gas was collected over water at 20.0 ^{o}C and 720.0 mmHg. What is its volume at STP? (430.6 mL)

$P_{gas} = 720.0 \text{ mmHg - } 17.5 \text{ mmHg} = 702.5 \text{ mmHg}$

$T_1 = 273 + 20 = 293 \text{ K}$ $\quad T_2 = 273 \text{ K}$

$$\frac{(702.5 \text{ mmHg})(500 \text{ mL})}{293 \text{ K}} = \frac{(760.0 \text{ mmHg})(V_2)}{273 \text{ K}}$$

43. A sample of gas collected over water occupies 50.0 L at 15 ^{o}C and 640 mmHg pressure. What is the dry volume at STP? (39.1 L)

$P_{gas} = 640.0 \text{ mmHg - } 12.8 \text{ mmHg} = 627.2 \text{ mmHg}$ $\quad T_1 = 273 + 15 = 288 \text{ K}$

$$\frac{(627.2 \text{ mmHg})(50.0 \text{ L})}{288 \text{ K}} = \frac{(760.0 \text{ mmHg})(V_2)}{273 \text{ K}}$$

44. 690.0 mL of oxygen are collected over water at 26.0 ^{o}C and a total pressure of 725.0 mm of mercury. What is the volume of dry oxygen at 52.0 ^{o}C and 800.0 mm pressure? (656.1 mL)

$P_{gas} = 725.0 \text{ mmHg - } 25.2 \text{ mmHg} = 699.8 \text{ mmHg}$ $\quad T_1 = 273 + 26 = 299 \text{ K}$

$T_2 = 273 + 52 = 325 \text{ K}$

$$\frac{(699.8 \text{ mmHg})(690.0 \text{ mL})}{299 \text{ K}} = \frac{(800.0 \text{ mmHg})(V_2)}{325 \text{ K}}$$

45. 400.0 mL of hydrogen are collected over water at 18.0 ^{o}C and a total pressure of 740.0 mm of mercury. Correct the volume to STP. (357.7 mL)

$P_{gas} = 740.0 \text{ mmHg - } 15.5 \text{ mmHg} = 724.5 \text{ mmHg}$ $\quad T_1 = 273 + 18 = 291 \text{ K}$

$$\frac{(724.5 \text{ mmHg})(400.0 \text{ mL})}{291 \text{ K}} = \frac{(760.0 \text{ mmHg})(V_2)}{273 \text{ K}}$$

46. A 45.0 mL sample of argon gas is collected over water at 729.3 mmHg and 25.0 ^{o}C. What would be the volume of this dry gas at standard conditions?(38.3 mL)

$P_{gas} = 729.3 \text{ mmHg - } 23.5 \text{ mmHg} = 705.8 \text{ mmHg}$ $\qquad$ $T_1 = 273 + 25 = 298 \text{ K}$

$$\frac{(705.8 \text{ mmHg})(45.0 \text{ mL})}{298 \text{ K}} = \frac{(760.0 \text{ mmHg})(V_2)}{273 \text{ K}}$$

47. A 19.1 L sample of He gas is collected over water at 681.3 mmHg and 18.5 ^{o}C. What would be the volume of this dry gas at standard conditions?(15.7 L)

$P_{gas} = 681.3 \text{ mmHg - } 16.0 \text{ mmHg} = 665.3 \text{ mmHg}$ $\qquad$ $T_1 = 273 + 18.5 = 291.5 \text{ K}$

$$\frac{(665.3 \text{ mmHg})(19.1\text{L})}{291.5 \text{ K}} = \frac{(760.0 \text{ mmHg})(V_2)}{273.15 \text{ K}}$$

48. 407 mL of H_2 gas is collected over water at 785.3 mmHg and 23.5 ^{o}C. What would be the volume of this dry gas at standard conditions? (376.5 mL)

$P_{gas} = 785.3 \text{ mmHg - } 21.7 \text{ mmHg} = 763.6 \text{ mmHg}$ $\qquad$ $T_1 = 273 + 23.5 = 296.5 \text{ K}$

$$\frac{(763.6 \text{ mmHg})(407 \text{ mL})}{296.5 \text{ K}} = \frac{(760.0 \text{ mmHg})(V_2)}{273 \text{ K}}$$

Ideal Gas Law

49. How many moles of gas are contained in 890.0 mL at 22^{o} C and 750.0-mm Hg pressure?(0.04 mol gas)

$$(750.0 \text{ mmHg})(890.0 \text{ mL}) = (x)\left(62360 \frac{\text{mL-mmHg}}{\text{mol-K}}\right)(295 \text{ K})$$

50. A1.09 g sample of H_2 is contained in a 2.00 L container at 20.0 ^{o}C. What is the pressure in this container in mm Hg?(4982.2 mmHg or 6.5 atm)

$$(x \text{ mmHg})(2.0 \text{ L}) = \left(\frac{1.09 \text{ g}}{2.00 \; g}\right)\left(62.36 \frac{\text{L-mmHg}}{\text{mol-K}}\right)(293 \text{ K})$$

51. Calculate the volume 3.00 moles of a gas will occupy at 24.0 ^{o}C and 762.4 mmHg. (72787.7 mL or72.9 L)

$$(762.4 \text{ mmHg})(x \text{ mL}) = (3.0 \text{ mol})\left(62360 \frac{\text{mL-mmHg}}{\text{mol-K}}\right)(297 \text{ K})$$

$$(762.4 \text{ mmHg})(x \text{ L}) = (3.0 \text{ mol})\left(62.4 \frac{\text{L-mmHg}}{\text{mol-K}}\right)(297 \text{ K})$$

52. How many moles of a gas would be present in a gas trapped within a 37.0 liter vessel at 80.00 ^{o}C at a pressure of 2.50 atm? (3.2 mol)

$$(2.5 \text{ atm})(37.0 \text{ L}) = (x \text{ mol})\left(0.082\frac{\text{L-atm}}{\text{mol-K}}\right)(353 \text{ K})$$

53. What volume will 1.27 moles of helium gas occupy at STP?(28.4 L OR 28.5 L)

$$(1.0 \text{ atm})(x \text{ L}) = (1.27 \text{ mol})\left(0.082\frac{\text{L- atm}}{\text{mol-K}}\right)(273 \text{ K})$$

$$(760.0 \text{ mmHg})(x \text{ L}) = (1.27 \text{ mol})\left(62.4\frac{\text{L-mmHg}}{\text{mol-K}}\right)(273 \text{ K})$$

54. At what temperature will 0.654 moles of neon gas occupy 12.30 liters at 1.95 atmospheres?(447.2 K)

$$(1.95 \text{ atm})(12.3 \text{ L}) = (0.654 \text{ mol})\left(0.082\frac{\text{L- atm}}{\text{mol-K}}\right)(x \text{ K})$$

55.A 30.6 g sample of gas occupies 22.4 L at STP. What is the molecular weight of this gas? (30.6 g/mol)

$$(1.0 \text{ atm})(22.4 \text{ L}) = \left(\frac{30.6 \text{ g}}{x}\right)\left(0.082\frac{\text{L- atm}}{\text{mol-K}}\right)(273 \text{ K})$$

56. A 40.0 g gas sample occupies 11.2 L at STP. Find the molecular weight of this gas. (80.0 g/mol)

$$(1.0 \text{ atm})(11.2 \text{ L}) = \left(\frac{40.0 \text{ g}}{x}\right)\left(0.082\frac{\text{L- atm}}{\text{mol-K}}\right)(273 \text{ K})$$

57. A 12.0 g sample of gas occupies 19.2 L at STP. What is the molecular weight of this gas?(14.0 g/mol)

$$(1.0 \text{ atm})(19.2 \text{ L}) = \left(\frac{12.0 \text{ g}}{x}\right)\left(0.082\frac{\text{L- atm}}{\text{mol-K}}\right)(273 \text{ K})$$

58. A 96.0 g sample of a gas occupies 48.0 L at 700.0 mmHg and 20.0 ^{o}C. What is its molecular weight?(52.2 g/mol)

$$(700.0 \text{ mmHg})(48.0 \text{ L}) = \left(\frac{96.0 \text{ g}}{x}\right)\left(62.4\frac{\text{L-mmHg}}{\text{mol-K}}\right)(293 \text{ K})$$

59. At STP 3.00 liters of an unknown gas has a mass of 9.50 grams. Calculate it's molar mass. (71 g/mol)

$$(760.0 \text{ mmHg})(3.0 \text{ L}) = \left(\frac{9.50 \text{ g}}{x}\right)\left(62.4\frac{\text{L-mmHg}}{\text{mol-K}}\right)(273 \text{ K})$$

60. At STP 150.0 mL of an unknown gas has a mass of 0.250 gram. Calculate it's molar mass.(27.3 g/mol)

$$(760.0\ \text{mmHg})(0.150\ \text{L}) = \left(\frac{0.25\ \text{g}}{x}\right)\left(62.4\frac{\text{L-mmHg}}{\text{mol-K}}\right)(273\ \text{K})$$

61. A 1.089 g sample of a gas occupies 4.50 L at 20.5 ^{o}C and 0.890 atm. What is its molar mass?(73.3 g/mol)

$$(0.890\ \text{atm})(4.50\ \text{L}) = \left(\frac{1.089\ \text{g}}{x}\right)\left(0.082\frac{\text{L-atm}}{\text{mol-K}}\right)(293.5\ \text{K})$$

62. A 0.190 g sample of a gas occupies 250.0 mL at STP. What is its molar mass? What gas is it? Compare molar mass of common gases. (17.0 g/mol; NH_3)

$$(1.0\ \text{atm})(0.25\ \text{L}) = \left(\frac{0.190\ \text{g}}{x}\right)\left(0.082\frac{\text{L-atm}}{\text{mol-K}}\right)(273\ \text{K})$$

63. If 9.006 grams of a gas are enclosed in a 50.00 liter vessel at 273.15 K and 2.0 atmospheres of pressure, what is the molar mass of the gas? What gas is this? (2.01 g/mol; H_2)

$$(2.0\ \text{atm})(50.0\ \text{L}) = \left(\frac{9.006\ \text{g}}{x}\right)\left(0.082\frac{\text{L-atm}}{\text{mol-K}}\right)(273.15\ \text{K})$$